A METHOD OF APPLYING INSECTICIDAL DUSTS QUANTITATIVELY AS A BASIS FOR CAGE TESTS OF INSECTICIDES

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The well-known method of comparing insecticides by caging plants after treatment, liberating insects in the cage, and then tabulating the mortality has met with many criticisms. The main objection to this method of comparing insecticides is that no satisfactory means of regulating the amount of material applied to each plant has been developed. The need for a quantitative method of applying dust uniformly to individual plants in a series has led to the development of the technic herein described.

The apparatus used consists of a precision duster and a cone-shaped settling chamber. The duster is capable of delivering small or large amounts of dust, quantitatively, into the settling chamber, which in turn confines the dust to a definite area. Almost any type of low-growing vegetable plant can be dusted with this apparatus. Pepper, cabbage, and cauliflower plants have been treated successfully in preliminary tests. Cabbage plants which have begun to head are not satisfactory, however, because of the difficulty of dusting all of the leaves.

Description of Apparatus

Precision duster.--This duster, which is illustrated by figures 1 and 2, operates on the principle of a positive dust feed into an air blast. The positive feed consists of a piston (fig. 1, B and C) which fits tightly enough into tube A (1⅜ inches in diameter) to prevent dust from slipping by. This piston consists of a brass disc or piston head (fig. 1, B), which is smooth on top, and a leather pump washer (fig. 1, C). The piston head is shaped to fit into the cup formed by the leather washer, and the shoulder of the head rests on the rim of the leather cup. The smooth brass head forms a continuous surface with the base of the outlet, F, when raised to its highest position. The air inlet, H, and the outlet, F, are attached to the cap, G. The air blast enters the cap through four small holes, two of which are shown at J. The other two holes are on the opposite side of the tube I. The cap, G, fits tightly over tube A, with the top of the tube resting at the base of outlet F. This cap, which might be screwed on, rests on a rubber washer supported by a shoulder, as shown in figure 2.

The plunger or piston is moved to any desired position by means of a small cog wheel which fits into the notched piston rod, as shown in figure 2. A lever has been attached to the larger wheel to aid in moving the piston uniformly.

Any amount of insecticide dust, from a fraction of a gram to an ounce, can be applied quantitatively and at a uniform rate with this apparatus. A given amount of dust (1 gram in studies of pepper and cabbage insects) is put into the tube with the piston lowered as shown in figure 1. The cap is replaced, the compressor started, and the air flow regulated by the air-adjusting valve shown in figure 2, a. A certain amount of dust is blown out at once, but this amount can be controlled by moving the piston to the desired position. As the air blast continues, the piston is slowly raised until it finally reaches the top. The air pressure and volume (which may be regulated as desired), together with the rate of piston movement, control the flow of dust. An air pressure of 20 pounds, which is supplied by an air compressor of 8/10 cubic foot capacity and regulated by the small air-adjusting valve (fig. 2, a), has given fairly uniform dust deposits.

A small amount of magnesium oxide, blown through the duster as needed, forms a thin coating on the metal of the dust chamber and prevents other dusts from sticking. After each dust application, with the air turned fully on, the duster is struck sharply several times to dislodge any dust particles that might have lodged within. At the first indication of sticking, the duster is cleaned with a cloth and another quantity of magnesium oxide is blown through.

Settling chamber.--Along with the development of a quantitative method of delivering insecticide dust comes the problem of confining the dust to a definite area. This has been done by using a conic settling chamber, illustrated by figure 3. The dimensions of this conic frustrum are: Base diameter, 30 inches; height, 43 inches; and diameter of top, 8 inches. This chamber is made of 1/64-inch red fiber-board, commonly used in making fiber filing cases or guide cards, reinforced by metal at the base and fitted with a removable fiber cap. Heavier material of the same type, 1/32 inch thick, which will be used in constructing more of these cones, is recommended instead of the thinner material. The cap has a small hole reinforced by a metallic eyelet or grommet. Any desired number of these settling chambers may be placed over individual plants to be treated.

Method of Operation

With the duster loaded and ready to operate, the nozzle is held in a perpendicular position as shown in figure 4. After the dust has been blown into the chamber, several minutes are allowed for the dust to settle. One gram of dust (derris diluted with talc) deposited an average of 1.3 milligrams of dust per square inch, with a range of 1.20 to 1.33 milligrams in four different applications. The distribution of dust over the surface of the base ranged from 1.15 milligrams per square inch at the outer edge to 1.33 milligrams per square inch at the center. Repeated tests of dust deposit by weighing glass slides exposed in the chamber showed that an average of 10 percent of the original amount of dust placed in the duster does not settle out but largely sticks to the sides of the chamber. Further tests are necessary to give a complete analysis of dust deposit by this method. Tests using cabbage worm mortality as a criterion

have shown a consistent increase in mortality with an increase in the percentage of rotenone.

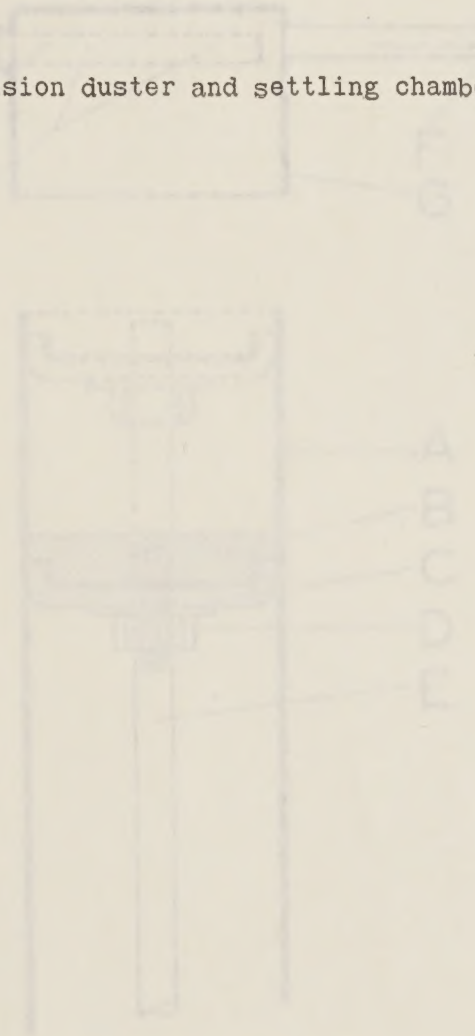
Explanation of Illustrations

Figure 1.--Diagram of duster showing positive feed principle.

Figure 2.--Precision duster.

Figure 3.--Settling chamber.

Figure 4.--View showing precision duster and settling chamber in use.



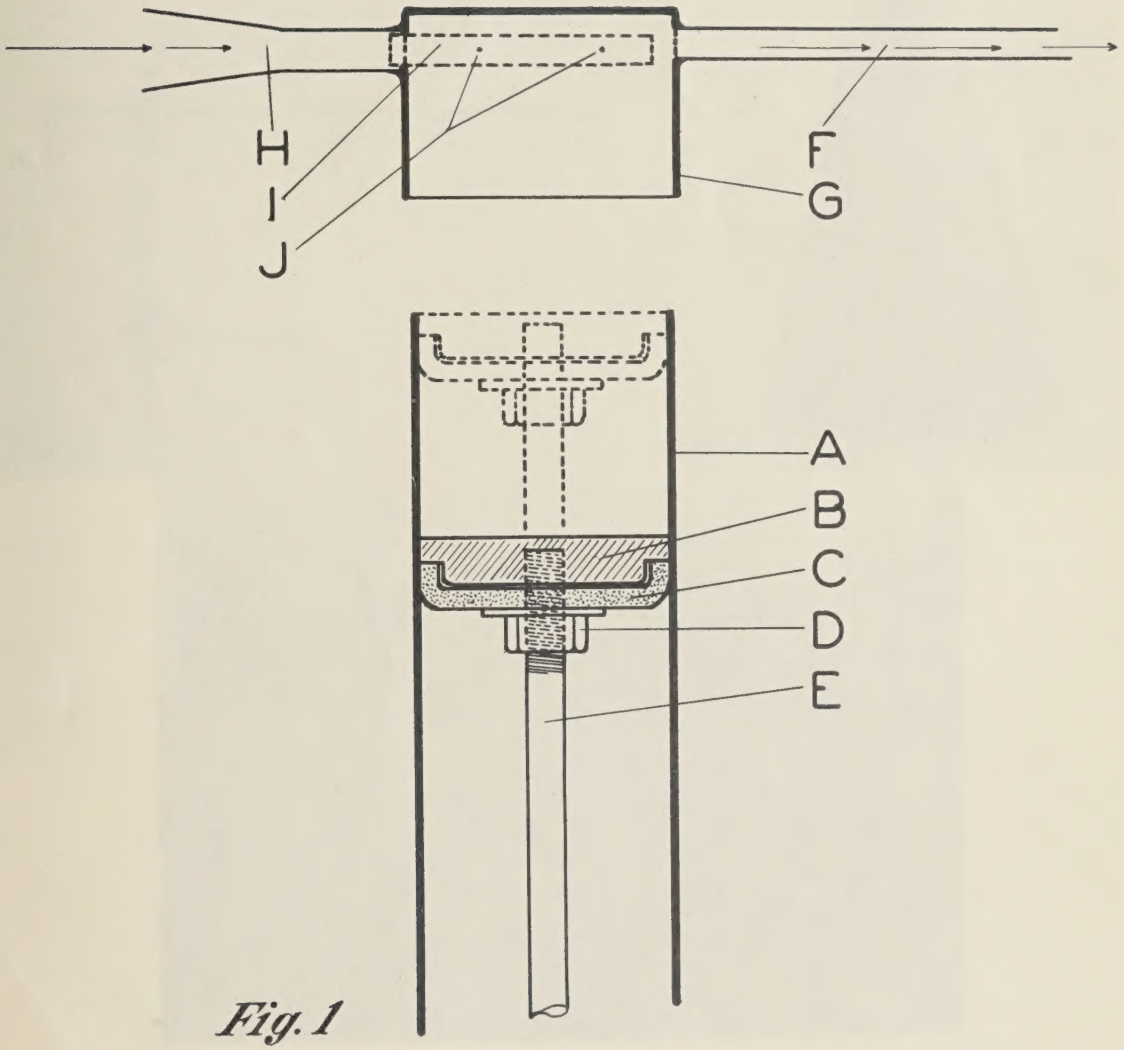
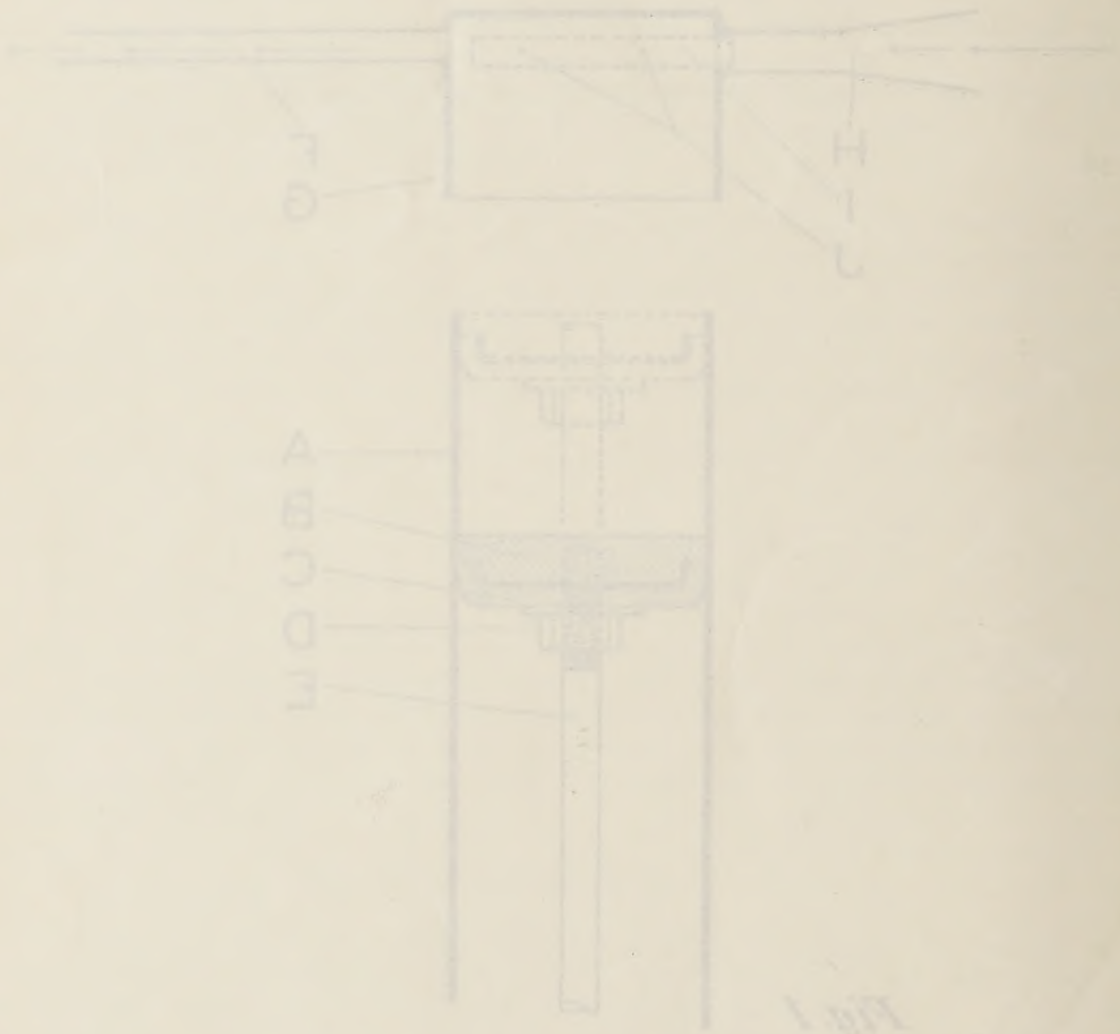


Fig. 1



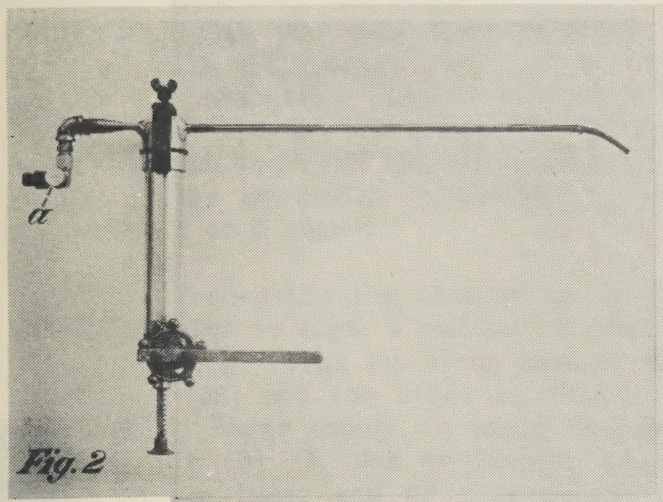


Fig. 2

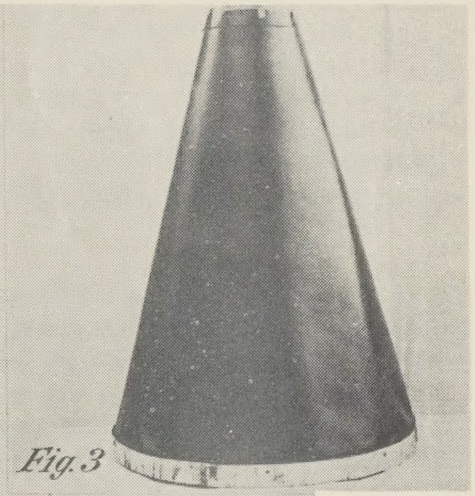


Fig. 3

Fig. 4